PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE HONORABLE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of

Naomasa SHIRAISHI

On Appeal from Group: 2851

Application No.: 10/679,151

Examiner: A. MATHEWS

Filed: October 6, 2003

Docket No.: 032136.09

For: PROJECTION EXPOSURE METHOD WITH LUMINOUS FLUX DISTRIBUTION

APPEAL BRIEF TRANSMITTAL AND PETITION FOR EXTENSION OF TIME

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Attached hereto is our Brief on Appeal in the above-identified application. Also attached hereto is our Check No. 205043 in payment of the Brief Fee under 37 C.F.R. 41.20((b)(2) of Five Hundred Ten Dollars ($510.00).

The unextended period for filing this Brief having expired on November 24, 2007, an extension of that period of five months is hereby requested. Included in our check is the amount of $2230 in payment of the fee for a five month extension of time for filing this Brief.

In the event of any underpayment or overpayment, please debit or credit our Deposit Account No. 15-0461 as needed in order to effect proper filing of this Brief.

Respectfully submitted,

Mario A. Costantino
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MAC:jls

Date: April 24, 2008

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01 FC:1402 510.00 OP
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BRIEF ON APPEAL

Appeal from Group 2851

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TABLE OF CONTENTS

I. REAL PARTY IN INTEREST

The real party in interest for this appeal and the present application is Nikon Corporation, by way of an Assignment recorded in the U.S. Patent and Trademark Office at Reel 5918, Frame 0848.

II. RELATED APPEALS AND INTERFERENCES

The following are prior or pending appeals, interferences or judicial proceedings, known to Appellant, Appellant's representative, or the Assignee, that may be related to, or that will directly affect or be directly affected by or have a bearing upon, the Board's decision in the pending appeal:

An Appeal is pending in related application no. 08/376,676.

III. STATUS OF CLAIMS

Claims 42-57, 70-74 and 90-92 are on appeal.

Claims 42-57, 70-74 and 90-92 are pending.

No claims are allowed, and no claims are objected to only for being dependent from a rejected base claim, but are otherwise allowable.

Claims 42-57, 70-74 and 90-92 are rejected.

No claims are withdrawn from consideration.

Claims 1-41, 58-69 and 75-89 are canceled.

IV. STATUS OF AMENDMENTS

An Amendment After Final Rejection was filed on August 21, 2007. By an Advisory Action dated August 31, 2007, it was indicated that the requested amendments had been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

In the following summary, reference is made to the substitute specification filed November 22, 2006.

The invention of claim 42 is directed to an exposure method for exposing on an object (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1, 16, 20, 27, 29, 37 and 40) a pattern having linear features extending along orthogonal first and second directions (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle pattern 28 in Fig. 15A shows linear features extending in one of the two directions). The method includes the steps of: (1) providing a light source having decreased intensity portions at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions (light source positions are defined at points Pε, Pη, Pτ, Pμ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29), respectively by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph 51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines 12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5); and (2) illuminating the pattern with light from the light source.

The invention of claim 47 is directed to a microdevice manufacturing method that images on a workpiece (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1, 16, 20, 27, 29, 37 and 40) a fine pattern having linear features extending along orthogonal first and second directions (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle

pattern 28 in Fig. 15A shows linear features extending in one of the two directions) to print the fine pattern on the workpiece. The method includes: (1) providing a light source having decreased intensity portions at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions (light source positions are defined at points Pε, Pη, Pτ, Pμ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29), respectively by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph 51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines 12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5); and (2) illuminating the pattern with light from the light source.

The invention of claim 52 is directed to a method of exposing on an object (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1, 16, 20, 27, 29, 37 and 40) a pattern having linear features extending in orthogonal first and second directions (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle pattern 28 in Fig. 15A shows linear features extending in one of the two directions). In accordance with the method, the pattern is illuminated with light obliquely (see paragraph 63, lines 1-11 and paragraph 133, lines 1-3) with respect to the pattern, and the strength of illumination of the pattern in a first plane of incidence including the first direction and the strength of illumination of the pattern in a second plane of incidence including the second direction are made lower than that in a third plane of incidence other than the first and second planes (light source positions are defined at points Pε, Pη, Pτ, Pμ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines

13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29) by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph 51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines 12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5).

The invention of claim 55 is directed to a method of manufacturing microdevices in which a fine pattern having linear features extending in orthogonal first and second directions (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle pattern 28 in Fig. 15A shows linear features extending in one of the two directions) is illuminated with light obliquely (see paragraph 63, lines 1-11 and paragraph 133, lines 1-3) with respect to the pattern and in which the illuminated pattern is imaged and printed on a workpiece (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1, 16, 20, 27, 29, 37 and 40). In accordance with the method, the strength of illumination in a predetermined plane of incidence is made greater than that in a first plane of incidence including the first direction and that in a second plane of incidence including the second direction and intersecting with the first plane of incidence perpendicularly (light source positions are defined at points $P\varepsilon$, $P\eta$, $P\tau$, $P\mu$ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29) by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph

51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines 12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5).

The invention of claim 70 is directed to a method for exposing on a substrate (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1, 16, 20, 27, 29, 37 and 40) an image of a pattern having components along orthogonal first and second directions (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle pattern 28 in Fig. 15A shows linear features extending in one of the two directions; reticle pattern 28 in Fig. 15C has components along orthogonal first and second directions). The method includes: (1) illuminating the pattern with light having increased light intensity distribution shaped by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph 51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines 12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5) within four sections relative to first and second axes, the first and second axes being defined to intersect with each other at a center and defined along the first and second directions (light source positions are defined at points $P\varepsilon$, $P\eta$, $P\tau$, $P\mu$ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29), respectively; and (2) projecting the image of the pattern on the substrate (the pattern image is projected onto the wafer by projection optical system 29 (Figs. 1, 16, 20, 26, 27, 29, 37 and 40), paragraph 61, lines 9-11, paragraph 64, lines 6-8, paragraph 74, lines 1-9, paragraph 257, lines 6-9).

The invention of claim 71 is directed to a method for exposing on a substrate (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1,

16, 20, 27, 29, 37 and 40) an image of a pattern having components along orthogonal first and second directions (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle pattern 28 in Fig. 15A shows linear features extending in one of the two directions; reticle pattern 28 in Fig. 15C has components along orthogonal first and second directions). The method includes: (1) illuminating the pattern with light having increased light intensity distribution shaped by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph 51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines 12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5) relative to, and within areas outside of, a cross-like portion defined to intersect at a center and defined along the first and second directions (light source positions are defined at points $P\varepsilon$, $P\eta$, $P\tau$, $P\mu$ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29); and (2) projecting the image of the pattern on the substrate (the pattern image is projected onto the wafer by the projection optical system 29 (Figs. 1, 16, 20, 26, 27, 29, 37 and 40), paragraph 61, lines 9-11, paragraph 64, lines 6-8, paragraph 74, lines 1-9, paragraph 257, lines 6-9).

The invention of claim 72 is directed to an exposure method for exposing on an object (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1, 16, 20, 27, 29, 37 and 40) a pattern having features extending in a predetermined direction (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle pattern 28 in Fig. 15A shows linear features extending in a predetermined direction). The method includes: (1) providing a light intensity distribution

having increased light intensity portions relative to a portion corresponding to a path in a plane of incidence including the predetermined direction (light source positions are defined at points Pε, Pη, Pτ, Pμ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29) by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph 51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines 12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5); and (2) illuminating the pattern.

The invention of claim 90 is directed to an exposure method for exposing on an object (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1, 16, 20, 27, 29, 37 and 40) a pattern having features extending along orthogonal first and second directions (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle pattern 28 in Fig. 15A shows linear features extending in one of the two directions; reticle pattern 28 in Fig. 15C has components along orthogonal first and second directions). The method includes: (1) providing a light source having decreased intensity portions at a center thereof and along first and second axes defined to intersect with each other at the center and defined along the first and second directions (light source positions are defined at points Pε, Pη, Pτ, Pμ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29), respectively by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph

51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines 12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5); and (2) illuminating the pattern with light from the light source. The light source includes four sections having substantially the same light intensity and being distributed in four quadrants defined by the center and the first and second axes, the four sections being disposed in an angularly symmetrical relationship with respect to the center (points Pε, Pη, Pτ, Pμ in Fig. 15D, which are disposed in four quadrants defined by the X and Y axes shown in Fig. 15D and are symmetrical with respect to the center point C; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29).

The invention of claim 91 is directed to a microdevice manufacturing method that images on a workpiece (paragraph 61, lines 9-12, paragraph 68, lines 1-4, paragraph 141, lines 1-3; wafer 30 in Figs. 1, 16, 20, 27, 29, 37 and 40) a fine pattern having linear features extending along orthogonal first and second directions (paragraph 4, lines 1-6, paragraph 58, lines 1-2, paragraph 68, lines 4-6, paragraph 93, lines 1-2, paragraph 128, lines 1-8; reticle pattern 28 in Fig. 15A shows linear features extending in one of the two directions) to print the fine pattern on the workpiece. The method includes: (1) providing a light source having decreased intensity portions at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions (light source positions are defined at points Pε, Pη, Pτ, Pμ in Fig. 15D, which are spaced from the X and Y axes shown in Fig. 15D; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29), respectively by a shaping optical system including at least a movable optical element (relay lens 15 (Figs. 1, 8 and 9) is a zoom lens, paragraph 59, lines 6-8; lens system 4 (Fig. 1) is a zoom lens, paragraph 90, lines 10-11) and an exchangeable optical element (diffraction grating pattern plate 12 (Figs. 1, 2, 4 and 6) is interchangeable, paragraph 51, lines 16-18; spatial filter 16 (Fig. 1) or 16c (Fig. 7) is interchangeable, paragraph 55, lines

12-15; prism 33 (Fig. 9) is interchangeable, paragraph 112, lines 1-5); and (2) illuminating the pattern with light from the light source. The light source includes four sections having substantially the same light intensity and being distributed in four quadrants defined by the center and the first and second axes, the four sections being disposed in an angularly symmetrical relationship with respect to the center (points Pε, Pη, Pτ, Pμ in Fig. 15D, which are disposed in four quadrants defined by the X and Y axes shown in Fig. 15D and are symmetrical with respect to the center point C; paragraph 130, lines 13-21; also see paragraph 80, lines 1-5 and paragraph 98, lines 1-29).

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following grounds of rejection are presented for review:

1) Claims 42-57, 70-74 and 90-92 are rejected under 35 U.S.C. §112, first paragraph.

2) Claims 42-57, 70-74 and 90-92 are rejected under 35 U.S.C. §103(a) as being unpatentable over JP-A-61-91662 (Horiuchi et al.) in view of U.S. Patent No. 4,947,413 (Jewell et al.), and further in view of either U.S. Patent No. 4,153,336 (Minami et al.) or U.S. Patent No. 4,871,257 (Suzuki et al.).

VII. ARGUMENT

The final rejection fails to establish a proper case of obviousness under 35 U.S.C. §103(a). In the absence of an anticipatory prior art reference, the issue becomes whether "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." 35 U.S.C. §103(a). In determining obviousness, the following four factors must be considered: (1) the scope and content of the prior art; (2) any differences between the prior art and the claims at issue; (3) the level of ordinary skill in the pertinent art; and (4) any secondary considerations evidencing non-obviousness, such as commercial success, copying, long felt but unsolved needs, failures of others, unexpected results, etc. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 127 S. Ct. 1727, 1734 (2007), *citing Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966). In the present application, the final rejection fails to consider Appellant's invention as a whole and fails to consider each reference as whole. Instead, the final rejection improperly picks and chooses aspects from each of the references and cobbles those pieces together, using Appellant's claims as a blueprint, in disregard to the teachings of the individual references. As a result, the final rejection relies upon impermissible hindsight to reject Appellant's claims.

A. Rejection of Claims 42-57, 70-74 and 90-92 under 35 U.S.C. §112, First Paragraph

1. Claims 42-57, 70-74 and 90-92

The final rejection asserts that "there appears to be no basis in the original disclosure for the method for imaging a fine pattern having linear features extending in orthogonal first and second directions and a method for providing a light source having decreased intensity portions at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions respectively." The final rejection

further states "the Examiner does not find where the original disclosure describes forming an image with linear features extending in orthogonal first and second directions." The final rejection then goes on to discuss the points P arranged along line segments L, and asserts that such points "do not make linear features." The final rejection also asserts that the original disclosure does not "specifically state that the light source has a decreased intensity portions [sic] at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions." Although the final rejection only specifically references claim 42 in the body of the rejection, all pending claims are identified as rejected.

Appellant respectfully submits that the original disclosure provides abundant disclosure of, and support for, the features recited in Appellant's claims.

The pattern "having linear features" referenced in most of the claims is the pattern, for example, of a mask or reticle that is exposed onto an object. Paragraph [0004] of Appellant's substitute specification explains that reticle patterns typically include opaque lines extending in the X and/or Y directions. Fig. 15a shows a one-dimensional line-and-space reticle pattern. See paragraph [0127]. The first sentence in paragraph [0058] indicates that the reticle pattern has a line width. The last sentence in paragraph [0068] indicates that the reticle has a line-and-space ratio. Paragraph [0093] indicates that the reticle patterns 28 have a periodic structure in the x and y directions, and that the diffraction grating patterns 13b1 - 13b4 shown in Fig. 4 "correspond to the reticle patterns 28" having periodic structure in the x and y directions. Thus, Appellant's drawings clearly show linear features extending in one direction, and Appellant's specification (for example, paragraphs [0004] and [0093]) clearly describes that reticle patterns sometimes have opaque lines in the X and Y directions. Accordingly, Appellant respectfully submits that the specification describes patterns having

linear features (i.e., opaque lines) extending in orthogonal first and second directions (in the directions of the X and Y axes).

With respect to positioning of the higher light intensity portions relative to those line patterns, as described in paragraph [0130] with respect to Fig. 15D, high intensity light sources are formed at each of the four points Pε, Pη, Pτ and Pμ, which are spaced from the X and Y axes shown in Fig. 15D and which are orthogonal to each other about central point C. The specification clearly describes that the light intensity is increased at those four points. Those locations are in four different quadrants defined by the X and Y axes also shown in Fig. 15D. The X and Y axes intersect at the center point C, which corresponds to the optical axis AX of the illumination system. See, for example, paragraphs [0123] - [0132]. Fig. 13 also shows four high intensity light areas 35a-35d positioned in the four quadrants. This structure results in lower light intensity areas at the center portion (point C corresponding to the optical axis AX) and along the X and Y orthogonal axes because the light sources are spaced away from those locations. Thus, the claimed subject matter of this application is supported by and described in the original disclosure.

2. **Claims 70, 71 and 90**

The rejection of claims 70, 71 and 90 should be withdrawn for the additional reason that these claims do not even recite linear features extending in first and second orthogonal directions. Claims 70 and 71 recite "an image of a pattern having components along orthogonal first and second directions." Claim 90 recites "a pattern having features extending along orthogonal first and second directions." The components/features of the pattern 28 in Fig. 15C are along orthogonal first and second directions (the x and y directions) as described in paragraph [0128]. Thus, the rejection of independent claims 70, 71 and 90 should be withdrawn for this additional reason.

3. Claim 72

The rejection of claim 72 should be withdrawn for the additional reason that claim 72 does not even recite first and second orthogonal directions. Claim 72 recites "a pattern having features extending in a predetermined direction." This is shown and described with respect to Fig. 15A, for example. Thus, the rejection of claim 72 should be withdrawn for this additional reason.

4. Conclusion

Accordingly, Appellant respectfully submits that the written description requirement of 35 U.S.C. §112, first paragraph, has been satisfied. Withdrawal of the rejection is requested.

B. Rejection of Claims 42-57, 70-74 and 90-92 Under 35 U.S.C. §103(a) Over JP-A-61-91662 (Horiuchi et al.) in view of U.S. Patent No. 4,947,413 (Jewell et al.), and further in view of either U.S. Patent No. 4,153,336 (Minami et al.) or U.S. Patent No. 4,871,257 (Suzuki et al.)

Appellant respectfully submits that there would have been no reason to combine the references to result in the features recited in Appellant's independent claims. Rather than considering the teachings of each reference as a whole, the final rejection picks and chooses certain features from Minami et al. or Suzuki et al., and then modifies Horiuchi et al. with those features, even though one skilled in the art would have no reason to modify the Horiuchi et al. system with the selected features from Minami et al. and Suzuki et al. because those features are taught to provide a function completely at odds with the goals of Horiuchi et al.

Horiuchi et al. discloses providing annular illumination. One way that Horiuchi et al. provides the annular illumination is to provide a plurality of apertures in a ring formation. See, for example, Fig. 3 of Horiuchi et al. The plurality of apertures are provided (instead of a continuous open ring) merely to provide a mechanical connection between the inner light blocking portion and the outer light blocking portion. Horiuchi et al. provides no teaching

that the apertures (or the light blocking portions between the apertures) should be located in any particular relationship to the direction(s) in which features of the reticle pattern extend.

The Office Action, in an attempt to read Appellant's claims on Horiuchi et al., randomly draws one axis "22 degrees from the horizontal" and then a second axis orthogonal to that first randomly-selected axis. The Office Action, however, recognizes that even with such randomly drawn axes in Horiuchi et al., there still is no teaching that those axes should extend in the directions of the linear feature(s) of the pattern. The Office Action then asserts that such a relationship between the apertures in Horiuchi et al. and the directions in which the linear features of the pattern extend would have been obvious in view of Minami et al. or Suzuki et al. Appellant respectfully disagrees.

Minami et al. discloses a device for detecting defects in a pattern contained, for example, on a photomask. The photomask includes "a normal pattern" of linear components and "defects" composed of non-linear components. See col. 1, lines 37-40. As taught throughout the Minami et al. disclosure, Minami et al. provides spatial filter 16 having the various light-blocking structures arranged relative to the linear components on the photomask so that images of the linear components are blocked or reduced, thereby enabling the defects to be more readily observed on the screen 17. See, for example, col. 3, lines 5-13 of Minami et al.

Minami et al. provides no reason for one having ordinary skill in the art to arrange the apertures of Horiuchi et al. in any particular relationship to the features of the pattern. The exposure apparatus of Horiuchi et al. forms images of the reticle patterns onto a substrate (for example, a wafer). Horiuchi et al. is not detecting defects in any image or pattern, and would not want to block the features of the pattern. Blocking the features of the pattern is the antitheses of Horiuchi et al.'s goals. Accordingly, Appellant's independent claims would not

have been obvious in view of Horiuchi et al. and Jewell et al., further in view of Minami et al.[1]

Suzuki et al. discloses a device for observing alignment marks on an object that also includes linear patterns that define a circuit pattern. See col. 1, lines 20-39, and col. 6, lines 49-62. Because the alignment marks are lines that extend in a direction that is different from the directions in which the linear patterns extend, Suzuki et al. provides aperture plate P_C so that diffraction and reflection light of the alignment mark is selected while light from the other patterns (the linear circuit patterns) is blocked. See col. 3, lines 7-12, col. 3, lines 23-30, and col. 6, lines 3-39.

Accordingly, like Minami et al. discussed above, Suzuki et al. provides no reason for one having ordinary skill in the art to arrange the apertures of Horiuchi et al. in any particular relationship relative to features of the pattern. The exposure apparatus of Horiuchi et al. forms images of the reticle patterns onto a substrate (for example, a wafer). Horiuchi et al. is not observing alignment marks, and would not want to block the linear patterns of the circuit pattern. Blocking the linear patterns of the circuit pattern is the antithesis of Horiuchi et al.'s goals. Accordingly, Appellant's claims are patentable over Horiuchi et al. in view of Jewell et al., and further in view of Suzuki et al.

Unlike Appellant's claims and Horiuchi et al., which form images on a substrate, Minami et al. and Suzuki et al. do not form images on a substrate, but rather observe a substrate. Unlike Appellant's claims and Horiuchi et al., which seek to form an image of a pattern having features extending in a predetermined direction or in orthogonal directions, Minami et al. and Suzuki et al. seek to block such patterns from being viewed. The

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[1] Jewell is relied on only for its teaching that it is known to provide reticles with linear patterns extending in orthogonal directions.

references do not lead one of ordinary skill in the art to the methods recited in Appellant's claims.

The references' combined teachings do not disclose or render obvious illuminating with decreased intensity portions at a center and on first and second axes defined along first and second directions of orthogonal pattern linear features as recited in independent claims 42, 47, 90 and 91, in an exposure method for exposing a pattern onto an object (claims 42 and 90) or in order to image a workpiece with a fine pattern (claims 47 and 91).

The references' combined teachings do not disclose or render obvious illuminating a pattern such that the strength of illumination in a first plane including a first direction of the pattern linear features and in a second plane including a second orthogonal direction of the pattern linear features is lower than in a third plane different from the first and second planes as recited in independent claims 52 and 55, in an exposure method for exposing a pattern onto an object (claim 52) or in order to image and print an illuminated pattern onto a workpiece (claim 55).

The references' combined teachings do not disclose or render obvious illuminating a pattern with increased light intensity portions within four sections relative to first and second axes defined to intersect each other at a center and defined along first and second orthogonal directions of pattern components as recited in independent claims 70, 90 and 91, in an exposure method for exposing a pattern onto an object (claims 70 and 90) or in order to image a workpiece with a fine pattern (claim 91).

The references' combined teachings do not disclose or render obvious an increased light intensity distribution relative to and outside of a cross-like portion defined to intersect at a center and defined along first and second orthogonal directions of pattern components, in an exposure method for exposing a pattern onto an object, as recited in independent claim 71.

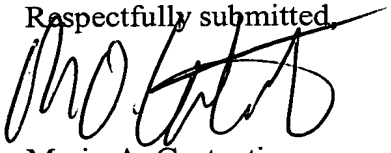
The references' combined teachings do not disclose or render obvious increased intensity portions relative to a portion corresponding to a path in a plane of incidence including a predetermined direction in which pattern features extend, in an exposure method for exposing a pattern onto an object, as recited in independent claim 72.

Withdrawal of the rejection is requested.

VIII. CONCLUSION

For all of the reasons discussed above, it is respectfully submitted that the rejections are in error and that claims 42-57, 70-74 and 90-92 are in condition for allowance. For all of the above reasons, Appellants respectfully request this Honorable Board to reverse the rejections of claims 42-57, 70-74 and 90-92.

Respectfully submitted,



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Filed: April 24, 2008

APPENDIX A - CLAIMS APPENDIX

CLAIMS INVOLVED IN THE APPEAL:

42. An exposure method for exposing on an object a pattern having linear features extending along orthogonal first and second directions, said method comprising:

providing a light source having decreased intensity portions at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions, respectively by a shaping optical system including at least a movable optical element and an exchangeable optical element; and

illuminating the pattern with light from the light source.

43. A method according to claim 42, wherein the intensity at each decreased intensity portion is decreased to about zero.

44. A method according to claim 42, wherein the light source comprises four sections having substantially the same light intensity and being distributed in four quadrants defined by the center and the first and second axes, and wherein the four sections are disposed in an angularly symmetrical relationship with respect to the center.

45. A method according to claim 44, wherein the intensity at each decreased intensity portion is decreased to about zero.

46. A method according to claim 42, wherein the light source is provided by light from one of a lamp and a laser.

47. In a microdevice manufacturing method including a step for imaging on a workpiece a fine pattern having linear features extending along orthogonal first and second directions to print the fine pattern on the workpiece, the improvements comprising:

providing a light source having decreased intensity portions at a center thereof and on first and second axes defined to intersect with each other at the center and defined along

the first and second directions, respectively by a shaping optical system including at least a movable optical element and an exchangeable optical element; and

illuminating the pattern with light from the light source.

48. A method according to claim 47, wherein the intensity at each decreased intensity portion is decreased to about zero.

49. A method according to claim 47, wherein the light source comprises four sections having substantially the same light intensity and being distributed in four quadrants defined by the center and the first and second axes, and wherein the four sections are disposed in an angularly symmetrical relationship with respect to the center.

50. A method according to claim 49, wherein the intensity at each decreased intensity portion is decreased to about zero.

51. A method according to claim 47, wherein the light source is provided by ultraviolet light from one of a mercury lamp and an excimer laser.

52. In a method of exposing on an object a pattern having linear features extending in orthogonal first and second directions, wherein the pattern is illuminated with light obliquely with respect to the pattern, the improvements residing in that:

the strength of illumination of the pattern in a first plane of incidence including the first direction and the strength of illumination of the pattern in a second plane of incidence including the second direction are made lower than that in a third plane of incidence other than the first and second planes by a shaping optical system including at least a movable optical element and an exchangeable optical element.

53. A method according to claim 52, wherein, in each of the first plane of incidence and the second plane of incidence, the illumination of the pattern with light is substantially blocked.

54. A method according to claim 52, wherein the predetermined plane of incidence is defined with an angle of about 45 degrees with respect to one of the first plane of incidence and the second plane of incidence.

55. In a method of manufacturing microdevices wherein a fine pattern having linear features extending in orthogonal first and second directions is illuminated with light obliquely with respect to the pattern and wherein the illuminated pattern is imaged and printed on a workpiece, the improvements residing in that:

the strength of illumination in a predetermined plane of incidence is made greater than that in a first plane of incidence including the first direction and that in a second plane of incidence including the second direction and intersecting with the first plane of incidence perpendicularly by a shaping optical system including at least a movable optical element and an exchangeable optical element.

56. A method according to claim 55, wherein, in each of the first plane of incidence and the second plane of incidence, the illumination of the pattern with light is substantially blocked.

57. A method according to claim 55, wherein the predetermined plane of incidence is defined with an angle of about 45 degrees with respect to one of the first and second directions.

70. A method for exposing on a substrate an image of a pattern having components along orthogonal first and second directions, said method comprising:

illuminating the pattern with light having increased light intensity distribution shaped by a shaping optical system including at least a movable optical element and an exchangeable optical element within four sections relative to first and second axes, the first and second axes being defined to intersect with each other at a center and defined along the first and second directions, respectively; and

projecting the image of the pattern on the substrate.

71. A method for exposing on a substrate an image of a pattern having components along orthogonal first and second directions, said method comprising:

illuminating the pattern with light having increased light intensity distribution shaped by a shaping optical system including at least a movable optical element and an exchangeable optical element relative to, and within areas outside of, a cross-like portion defined to intersect at a center and defined along the first and second directions; and

projecting the image of the pattern on the substrate.

72. An exposure method for exposing on an object a pattern having features extending in a predetermined direction, characterized by:

providing a light intensity distribution having increased light intensity portions relative to a portion corresponding to a path in a plane of incidence including the predetermined direction by a shaping optical system including at least a movable optical element and an exchangeable optical element; and

illuminating the pattern.

73. A method according to claim 70, further comprising relatively moving said projected image and said substrate along an optical axis of a projection system during exposure of said substrate.

74. A method according to claim 71, further comprising relatively moving said projected image and said substrate along an optical axis of a projection system during exposure of said substrate.

90. An exposure method for exposing on an object a pattern having features extending along orthogonal first and second directions, said method comprising:

providing a light source having decreased intensity portions at a center thereof and along first and second axes defined to intersect with each other at the center and defined

along the first and second directions, respectively by a shaping optical system including at least a movable optical element and an exchangeable optical element; and

illuminating the pattern with light from the light source, wherein the light source comprises four sections having substantially the same light intensity and being distributed in four quadrants defined by the center and the first and second axes, and wherein the four sections are disposed in an angularly symmetrical relationship with respect to the center.

91. In a microdevice manufacturing method including a step for imaging on a workpiece a fine pattern having linear features extending along orthogonal first and second directions to print the fine pattern on the workpiece, the improvements comprising:

providing a light source having decreased intensity portions at a center thereof and on first and second axes defined to intersect with each other at the center and defined along the first and second directions, respectively by a shaping optical system including at least a movable optical element and an exchangeable optical element; and

illuminating the pattern with light from the light source, wherein the light source comprises four sections having substantially the same light intensity and being distributed in four quadrants defined by the center and the first and second axes, and wherein the four sections are disposed in an angularly symmetrical relationship with respect to the center.

92. A method according to claim 52, wherein the strength of illumination of the pattern along an entirety of the first direction and the strength of illumination of the pattern along an entirety of the second direction are made lower than that in the third plane of incidence.

APPENDIX B - EVIDENCE APPENDIX

NONE

APPENDIX C - RELATED PROCEEDINGS APPENDIX

NONE